Soil Conservation

July 1978

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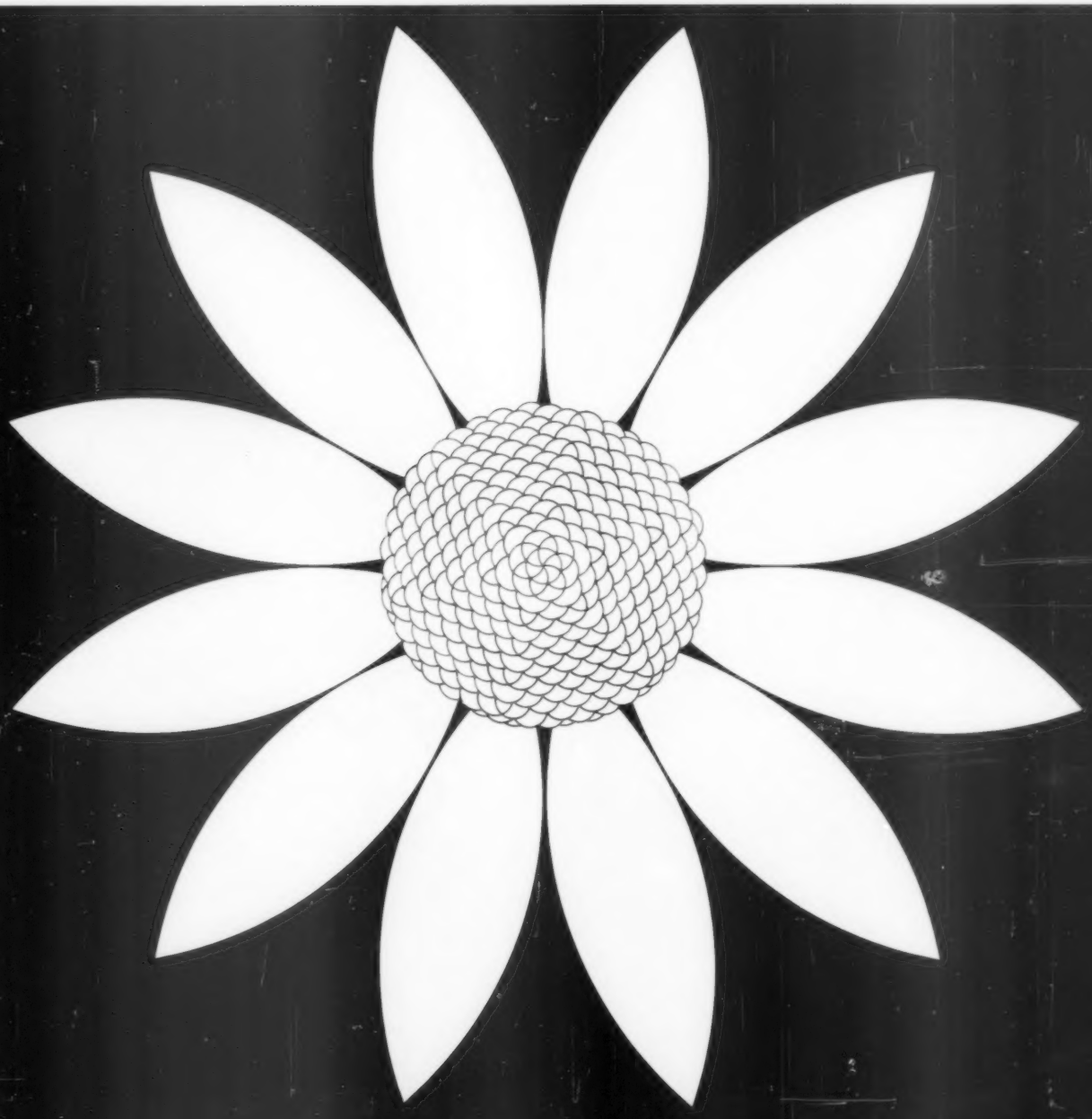

From the Administrator

1978—A Banner Year for New Conservation Plants

SCS's plant materials centers are releasing a record number of conservation plants this year. In just the first 5 months of 1978, the centers released 15 varieties for commercial production, as compared to a total of 7 varieties released in 1977. By the end of the year, even more new plants will be available to help control erosion and sedimentation and to improve the quality of the environment.

The new conservation plants, released in cooperation with other Federal and State agencies, include:

- 'Alamo' switchgrass to control shoreline erosion and protect flood control structures.
- 'King-Red' Russian olive and 'Flame' Amur maple for shelterbelts and windbreak plantings, landscaping, and wildlife food and cover.
- Three varieties of wildflowers to reestablish prairies and to beautify and protect roadsides and recreation areas.
- 'Barranco' desertwillow for windbreaks and screens.

The new releases indicate how SCS's plant materials program is responding to the needs of the 1970's. We no longer search exclusively for conservation plants to be used on the farm, although these are still a major part of our work. Now we have broadened our scope, and we are evaluating environmental improvement plants for a wide range of uses.

For example, we have stepped up the search for plants that will help reclaim mined land, protect sand dunes and control shore erosion, stabilize construction sites and other critical areas, and beautify the landscape as they work. We are looking for plants that will help stabilize waste disposal areas, provide food and cover for wildlife, tolerate pollution and toxic soil conditions, and retard the spread of fire.

Each SCS employee and conservation district cooperator can participate in the plant materials program in several ways.

Be aware of current plant studies at the center serving your area and the type of plants that will help meet identified needs. Many of the plants eventually selected for release originally were sent in by SCS field employees in response to "wanted" circulars from the centers.

Encourage cooperators in your district to participate in performance testing of plant materials where their soils, sites, and land use conditions are representative.

Finally, encourage commercial production and recommend the use of plants released by the centers to cooperators in your district. After all, the plant materials specialists and soil conservationists spent years determining that these varieties are indeed the best for their specific conservation uses.

Mel Davis

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Soil Conservation

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Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:
Among the many new conservation plants released this year are two strains of Maximilian sunflower (see pages 4 and 5).

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Here Come the Sunflowers

Two strains of Maximilian sunflower recently joined the ranks of conservation plants released by SCS.

by Barbara L. Maus
and Dale D. Allen

Sunflowers bring to mind images of warm, lazy summer afternoons. But throughout Texas and parts of the Midwest, sunflowers will soon be hard at work stabilizing the soil and providing forage for livestock and wildlife.

The Soil Conservation Service released two strains of Maximilian sunflower, *Helianthus maximiliani,* to seed growers this year—'Prairie Gold' and 'Aztec'. A limited supply of seed is expected to be available to the public by fall.

Prairie Gold is especially adapted to the Midwest. Its good root structure holds the soil in place, providing natural erosion control.

When planted with other varieties of wildflowers and grasses, Prairie Gold has good potential for planting on roadsides; in rest areas, parks, gardens, and recreation areas; and for reestablishing prairies. It is also suitable for use in wildlife habitat areas.

Prairie Gold grows with other

true-prairie and mixed-prairie plants such as big bluestem, little bluestem, sideoats grama, switchgrass, prairie dropseed, and porcupinegrass. It grows from 20 to 90 inches tall and has numerous leaves and bright-yellow, round flowers. The plants bloom from late July through October.

Prairie Gold grows best in the western part of the Midwest—Nebraska, Kansas, and parts of Colorado, Wyoming, South Dakota, Iowa, Missouri, and Oklahoma.

During the last 10 years, SCS, the University of Nebraska, and the Nebraska Department of Roads cooperated in testing Prairie Gold.

Aztec Maximilian sunflower is similar to Prairie Gold in appearance and uses, but the area of adaptation is different. In the 1960's, SCS personnel in Texas, Oklahoma, Kansas, and Nebraska collected seed from native Maximilian sunflowers for evaluation at plant materials centers. Specialists looked for the most widely adapted and most productive strain.

'Aztec' Maximilian sunflower, far left, and 'Prairie Gold', right, will be hard at work in Texas and the Midwest holding the soil and beautifying the landscape.

"We had to determine how much seed to plant to get a stand, how to manage the stand for maximum seed production, and how to harvest the seed," said Wayne Everett, SCS plant materials specialist in Texas. "Developing that kind of technology is an extremely important part of our plant materials work."

Everett explained that merely collecting, evaluating, and proving the value of a new plant strain is of little value unless you can grow and harvest enough seed to make extensive field tests.

"The end product of the plant materials effort is a plentiful supply of a valuable plant that will sell at a reasonable price," Everett continued. "By developing cultivation and harvesting methods, we help commercial seed growers and livestock producers achieve that goal."

Aztec underwent extensive field testing. Beginning in 1969, plantings were made at 55 locations in Texas, 17 in Oklahoma, and 11 in Kansas. The plant proved to be adapted to most soil types for range seeding mixtures where average annual rainfall is 18 inches or more. The plant did not appear to be adapted to wet or saline soils.

Initial observation plantings at Jackson, Miss., and Americus, Ga., also indicate excellent adaptability and performance. However, further trials are needed to completely document the area of adaptation.

Maximilian sunflower is native to most of the grasslands of the Southwest, but the plant is so relished by livestock and wildlife that it has been killed out on most rangeland. It is especially attractive to cattle, sheep, horses, goats, and deer. Birds eat the seeds readily, and the tall, dense growth provides cover for several species of wildlife. Besides being very palatable, Maximilian sunflower is also high in protein.

"Many livestock producers in Texas would like to include seed for a native plant used by livestock and wildlife in their range seeding mixtures," said Everett. "But seed for such plants simply has not been available commercially."

Aztec was released to seed growers by SCS in cooperation with the Texas Agricultural Experiment Station and the Texas Parks and Wildlife Department.

Field tests at SCS plant materials centers in Knox City, Tex., and Manhattan, Kans., indicate that Aztec and Prairie Gold are equal to, or better than, any other Maximilian sunflower collection for ease of establishment, vigor, and seed production.

With the rediscovery of wildflowers, plants like Prairie Gold and Aztec are again spreading their colorful beauty over the landscape as they did in the past.

Ms. Maus is public information specialist, SCS, Lincoln, Nebr.
Mr. Allen is public information officer, SCS, Temple, Tex.

A Plant Makes Good in the Southwest

by Larry K. Holzworth
and Jacob C. Garrison

'Corto' Australian saltbush is a drought and alkali tolerant plant. It is helping to stabilize roadbanks, ditchbanks, and minespoils in the Southwest.

The Soil Conservation Service and the Arizona Agricultural Expriment Station have announced the selection and release of 'Corto' Australian saltbush, *Atriplex semibaccata.* The release of the shrub gives the southern parts of Arizona and California a superior Australian saltbush plant to use as ground cover for controlling erosion on highway rights-of-way, construction sites, and similar disturbed areas. Corto is also well suited for landscaping around suburban homesites and buildings and for use in firebreaks.

Australian saltbush is a semi-herbaceous plant native to Australia. The shrub was introduced into California through the California Agricultural Experiment Station in the 1880's, and various strains have adapted to conditions in southern California, Arizona, and New Mexico. Several strains of the plant were tested at the SCS plant materials center (PMC) in Tucson, Ariz., and Corto was selected for its uniform growth and drought tolerance. It had the best combination of conservation characteristics and range of adaptation to control erosion and beautify the landscape.

Corto is a perennial plant. It is 8 to 10 inches tall and grows almost flat along the ground, spreading to a diameter of approximately 6 feet. Stems become somewhat woody, but the plant is primarily herbaceous. Leaves are numerous and gray-green. The flowers are inconspicuous, and single plants have both male and female reproductive organs but in separate flowers. Male flowers are on the end of the stems, and female flowers are in the upper leaf axils. Fruits are fleshy and turn red when mature.

Corto can be established and maintained under various site conditions. Plants provide good cover in areas that have an annual precipitation of 10 to 12 inches. On arid sites supplemental irrigation or run-in moisture from roadsides and drainageways is needed for establishing and maintaining stands. Some irrigation on all sites helps insure stand establishment. Corto grows best at elevations below 3,500 feet. Older plants at the PMC were killed back to the crown when the temperature fell below 25° F. Young plants withstood 17° and recovered in the spring. It is probable that plants would be permanently damaged at temperatures less than 10°.

Corto is best adapted to light and medium textured soils. It is well adapted to saline-alkali sites. Tests conducted at a copper mine on mine tailings, overburden, and a mixture of tailings and overburden showed good plant vigor with pH readings of 7.8 to 8.2 and total soluble salts of 2,870 parts per million—about 6 tons of soluble salts per acre foot of soil.

Plants are short lived, but stands are reestablished from seed. Corto has approximately 246,000 seeds per pound. Seeding rates of 7 pounds per acre of pure live seed have resulted in adequate stands on critical areas. Planting in late fall or early spring provides the cool weather best for seedling establishment. Drilling the seed less than one-half inch into a firm, clean seedbed and compacting the soil around the seed results in good germination.

Breeder and foundation seed will be maintained at the PMC in Tucson. Foundation seed is available to growers through the Arizona Crop Improvement Association and natural resource conservation districts.

'Corto' Australian saltbush stabilizes the soil and beautifies the landscape. This stand of Corto provides excellent ground cover along the city of Tucson flood control channel.

Mr. Holzworth is manager, Tucson Plant Materials Center, SCS, Tucson, Ariz.
Mr. Garrison is plant materials specialist, SCS, Phoenix, Ariz.

The Mark of 'Zorro'

by Kenneth Croeni
and Mark W. Testerman

'Zorro' annual fescue has a big job in California. It is holding the soil along roadsides, at mine sites, and in-between rows of crops.

'Zorro' annual fescue, *Festuca megalura,* is an annual, self-reseeding grass with a wide variety of conservation uses. Originally a range plant, Zorro can also be used for stabilizing roadsides, revegetating minespoil, and providing cover in orchards and vineyards.

Testing of the grass began in 1970 at the Soil Conservation Service plant materials center (PMC) in Lockeford, Calif. SCS and the University of California released Zorro to commercial nurseries and seed producers in early 1977.

The exact origin of Zorro annual fescue has not been determined. Plant materials specialists believe it was brought into California either by Mexican or Spanish settlers who also introduced cattle into the State.

Zorro is considered a poor range grass by ranchers. But its ability for quick establishment and adaptability to poor soil conditions make it valuable for critically disturbed areas.

Zorro annual fescue is one of the first plants to start growing when the fall rains begin. Once started, it grows quickly and establishes an extensive, fibrous root system. The grass grows in short, tight bunches and has narrow blades.

Testing along newly constructed highways showed Zorro was superior to the conventional barley and ryegrass mixture. Zorro started growing earlier, established good cover faster, and was more tolerant of shallow, low-fertility soils. In many cases Zorro grew where the barley-ryegrass mixture failed. An added benefit of Zorro is the rich golden color of the grass in spring, which provides a pleasing background for colorful wildflowers.

Since Zorro performed so well on the poor highway soils, the PMC staff decided to test it for use in minespoil revegetation. The grass was tested at the Owens-Illinois mining operation near Ione, Calif. The company mines sand and gravel for manufacturing glass, and soils at the mine were heavy textured and acidic. Eleven grasses and legumes were planted on the minespoil, but only Zorro survived.

Zorro also shows promise as a cover crop. It has proved useful in almond orchards and vineyards. Like all cover crops, it provides erosion protection and reduces soil compaction. Since it is an annual, it can be worked under in late spring to reduce interference with irrigation and harvesting operations. Further testing is needed to determine the extent of its application for cover crops.

The range of Zorro annual fescue extends throughout California's central and coastal valleys and into the foothills. Testing is currently being conducted to see if Zorro is also adapted to conditions in southern California. The lower limits of rainfall tolerance have not been determined yet but could prove to be the limiting factor.

Foundation seed is maintained at the PMC and is made available to certified seed producers through the California Crop Improvement Association. Seed growers in resource conservation districts can also obtain seed through the district's seed increase program.

Mr. Croeni is manager, Lockeford Plant Materials Center, SCS, Lockeford, Calif.

Mr. Testerman was soil conservationist, Lockeford Plant Materials Center, SCS, Lockeford, Calif., and is now manager, Big Flats Plant Materials Center, SCS, Big Flats, N.Y.

Rows of 'Zorro' annual fescue are planted in the fall at the Lockeford Plant Materials Center and harvested for foundation seed and seed for test plots.

Remember 'Alamo'

by Dale D. Allen

An SCS employee on the lookout for conservation plants found 'Alamo' switchgrass, a plant to control shoreline erosion, protect flood control structures, and provide forage for livestock.

In Texas, 'Alamo' switchgrass, *Panicum virgatum,* is the latest grass variety released by the Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station.

The newly named variety is native to the central and southern parts of the State. It is a warm season bunchgrass that grows 3 to 7 feet high. In 1964, Laramie E. McEntire, now SCS district conservationist at Canadian, found the plant growing on the north bank of the Frio River near Three Rivers. Recognizing the superior growth characteristics of the robust plant, McEntire dug the plant up, transplanted it in his yard, and nurtured it.

When the plant produced seeds, McEntire sent them to the SCS plant materials center (PMC) at Knox City, Tex., where more than 1,000 different plants are grown and evaluated each year. During the initial evaluation, the new strain showed good seedling vigor as well as excellent forage and seed production qualities. The strain appeared very promising and it was moved to an isolated block for continued growth and seed production.

Alamo switchgrass proved so well adapted to the south Texas climate that it greened up earlier than commercial strains at the PMC and produced seed 2 months later, adding up to a longer period of forage use during the year.

Other strains of switchgrass previously available from commercial sources are adapted only to the northern parts of Texas. When they were planted in central Texas or south Texas, the plants either didn't grow or died after a few years. Livestock producers in the southern two-thirds of the State have desperately needed a dependable strain of switchgrass for use in range and pasture plantings. Alamo was selected to fill that need.

The grass has also proved to be extremely useful for preventing shoreline erosion when planted on earthen dams. It tolerates inundation and helps protect the shoreline from damage by wave action. Alamo has been easier to establish on dams than other strains of switchgrass.

The recommended rate for seeding in rows is 1 to 2 pounds per acre. In the spring of 1978, seed growers planted more than 900 pounds of foundation seed.

Mr. Allen is public information officer, SCS, Temple, Tex.

'Alamo' switchgrass has proved to be a good range and pasture plant and protects shorelines and earthen dams from erosion.

Bountiful Roses on the Contour

by Nadine E. Pitts

At a nursery in Pennsylvania, planting roses on the contour and other conservation practices are protecting the soil and helping to insure a bountiful harvest.

From July through September motorists on U.S. Route 1 near West Grove, Pa., can see large fields of roses like a magnificent public garden along the highway. The fields are part of an unusual farm where the crop is roses grown on the contour.

Following the contour of the land is the answer to protecting the nursery's fertile soil against erosion, an ever-present threat in the historic, rolling countryside in the southeastern part of the State.

Conard-Pyle Company, owners of the Star Roses nursery, first sought help from the Chester County Conservation District and the Soil Conservation Service 18 years ago. The SCS district conservationist assisted the company in developing a conservation plan that incorporated a combination of practices to protect the nursery's 464 acres that range from 3 to 15 percent slopes from erosion.

To lay out contour strips on two fields totaling 92 acres, the nursery needed to do some land forming to obtain more uniform slopes and grades. Fill slopes were graded to a 3:1 slope or better in the area around the offices and buildings, and critical area plantings were established to stabilize the area.

Following a revision in the Star Roses conservation plan 3 years ago, additional conservation practices were adopted to combat erosion, including 1½ acres of grassed waterways seeded with tall fescue or creeping red fescue. The acreage in contour strips was more than doubled, to a total of 204 acres. Roses are rotated with orchardgrass and oats every 6 years. In one 35-acre field, crop residues are left on or near the surface during critical erosion periods.

"Other nurseries in the county are applying the same practices because they work so well in keeping the topsoil in place," said Elbert Wells, SCS district conservationist.

Cooperator R. J. Hutton, the major owner, and R. Vanderbilt, the nursery operator, feel a special need to insure the land's continued use for rose culture. In 1928, the nursery acquired a tract of land at West Grove that had been part of the original grant from Charles II, King of England, to William Penn. When the parcel of land was deeded to Penn's grandson in 1731, the deed provided for the payment of a red rose yearly in lieu of rent. Two later deeds carried the same provision.

Forty years ago, the nursery resumed the symbolic payment of rent to the descendants of William Penn. Each year the first Saturday after Labor Day is Red Rose Rent Day, the occasion for ceremonies that draw growers and lovers of roses from all over the United States and other countries. At the 1977 ceremony, Henry Marc Cathey, chief, Ornamentals Laboratory, U.S. Department of Agriculture, and president of the American Horticultural Society, was the featured speaker.

In a nursery field, a home garden, or a city plot, growing roses on the contour in combination with other conservation practices enhances the environment and saves the soil.

Elbert Wells, SCS district conservationist, reviews the conservation plan for the Star Roses nursery. Growing roses on the contour is one practice that is helping protect the soil.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.

Conservation Show and Tell

by Lynn Betts

It doesn't always take a new idea to boost conservation programs. Sometimes polishing an old idea and following through on it works just as well.

Soil Conservation Service personnel in Iowa found that out last year when they put a book together to help "sell" conservation.

"A book of pictures is not a new idea—we've seen copies of books made up in the 1940's to explain conservation practices," said State Conservationist William Brune. "What we needed was an attractive, professional book of color photographs that SCS field personnel could take with them on visits to landowners."

A five-member committee made up of SCS district conservationists and technicians worked on the details of the book. "There were other books around, but before this, each office had to make its own with the materials at hand," said District Conservationist Lyle Riedinger, committee chairperson. "We wanted a clean-looking, simple book that all the field offices could use to sell conservation."

"Protecting Your Soil," Iowa's new conservation "salesbook," is helping conservationists do just that. It is in an attractive three-ringed binder and begins by explaining the organization of the soil conservation districts and SCS and how they work together. It also shows a sample conservation plan which is a part of the overall planning process.

Pages of color photos with brief captions give land users a clear idea of what conservation practices will look like on their land and how much soil they can expect to save. For example, the two-page spread on terraces uses five photos and one diagram, and the caption reads, "Terraces cut soil losses 60 to 80 percent." The print is large and clear.

Other practices illustrated in the book are contouring, stripcropping, diversions, grassed waterways, grade stabilization structures, farm ponds, drainage, conservation tillage, pasture management, windbreaks, and wildlife plantings. SCS employees at each office are encouraged to add other good quality, local photos of conservation practices to the salesbook.

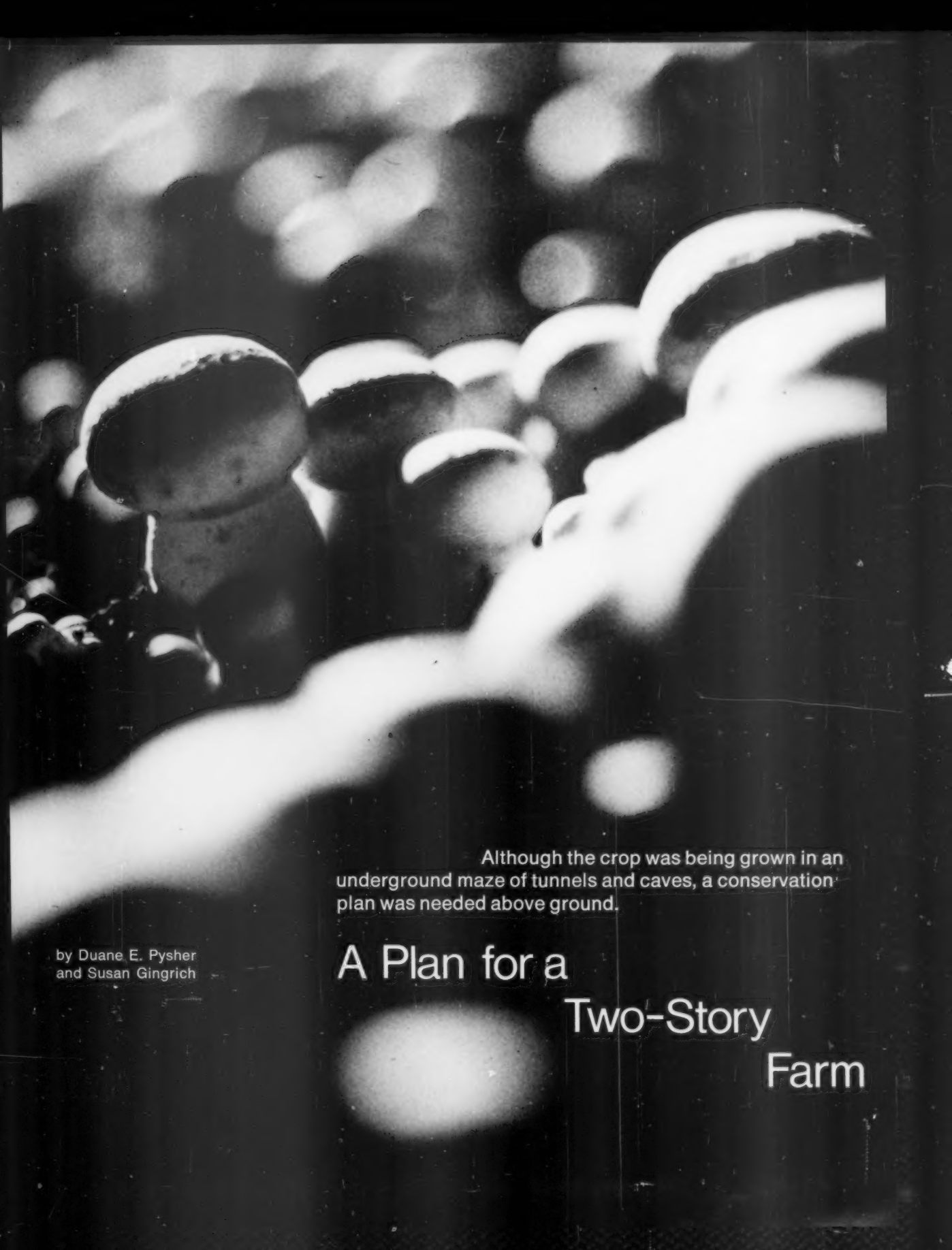
"Initial distribution of the book averaged three per field office," said Area Conservationist John Baker, "but the committee felt that each district conservationist, conservation technician, and clerk should have a copy." The State office in Des Moines backed the committee by distributing materials and instructions for assembling the salesbooks statewide.

"There's a clerk in every field office ready to show the book to anyone who visits the office," said Baker.

"We know these books cost some money," Brune said, "but we look upon a professional, illustrated book of conservation practices as a needed tool for getting more conservation on the land."

Carolyn Marshall, Kossuth County Soil Conservation District clerk, uses the conservation salesbook to show Herbert Krauss, a farmer in Fenton, Iowa, how terraces look on the land, how they are constructed, and how much soil they can save.

Mr. Betts is public information officer, SCS, Des Moines, Iowa.



Although the crop was being grown in an underground maze of tunnels and caves, a conservation plan was needed above ground.

A Plan for a Two-Story Farm

by Duane E. Pysher and Susan Gingrich

Roger Claypoole, farm manager at Worthington (left), and Duane Pysher, SCS district conservationist, examine the used organic soil after it has been applied on one of the farm's fields.

Deep under a 1,258-acre farm in Armstrong County, Pa., thrives another 800-acre farm that produces a 30 million-pound crop yearly. Electric carts carry farmers into the depths of the earth where, in the absence of rain and sunlight, the crop grows in the quiet darkness. Wearing electric miners' caps instead of straw hats, farmers go about their daily chores, regardless of the surface weather conditions.

It isn't a scene from science fiction; it's a farming operation that's going on today in western Pennsylvania. The Butler County Mushroom Farm has two operations, one in West Winfield in Butler County and one in Worthington in Armstrong County. Both operations have a conservation plan on their surface acres. But the larger farm in Worthington, described above, has a plan that covers more than 1,000 acres.

The underground mushroom farms were started when it was discovered that the abandoned limestone mines in the Allegheny Mountains had ideal conditions for growing mushrooms—constant darkness, an unvarying temperature of 60° F, and high humidity. The West Winfield operation began in 1937, and the Worthington farm was started in 1966.

Making the compost the mushrooms are grown in requires vast amounts of mineral and organic matter. The combined production of the farms—45 million tons of mushrooms annually—takes 30,000 tons of hay and corn cobs, 94,000 tons of straw-bedded horse and chicken manure, 3,000 tons of gypsum, and 200 tons of urea. The material is blended and put into large trays where the mushrooms are spawned and grown to maturity. At the end of a 100-day crop cycle, the last mushroom is picked. The used compost is then sterilized and spread onto open fields where it stays for 3 years.

This specialized farming operation creates special problems in land use and management above ground. Roger Claypoole, land use manager for the mushroom farm in Worthington, sought help from the Armstrong Conservation District and the Soil Conservation Service. A conservation plan was developed to help Claypoole control runoff and eliminate drainage problems on the 1,258 surface acres. His interest in conservation has led Claypoole to being appointed one of the directors of the Armstrong Conservation District.

In planning, conservationists first considered the kinds of soils on the farm and the best uses for each type of soil. For example, sites for spray irrigation using waste water and spreading the used compost were planned on well-drained soils. Where compost would be spread on

The mushroom farms have an intensive maintenance program to protect workers in the underground caves and tunnels. "Chippers" check a passageway ceiling for safety.

After spawning, each 1-ton tray of compost is covered with a layer of rich organic soil that has been recycled from used compost spread above ground for 3 years.

moderately well-drained soils, tile drainage was planned. Somewhat poorly drained soils were to be used for permanent hayland only. The plan also included grassed waterways, grassed filter strips, tile drainage, subsoiling, and no-till seeding.

Prior to spreading the used compost on the field, the soil is scarified, or subsoiled, to a depth of 16 inches to increase absorption of water into the soil profile and reduce runoff. Any runoff from the fields that does occur is directed into either grassed waterways or grassed filter strips which are seeded with reed canarygrass. Tile drains were installed to eliminate seep areas in the fields that were spread with compost. All tile outlets empty into woodlands where special limestone filter beds have been constructed to allow the discharge water to soak into the ground.

A 5-year rotation is followed on all the curing fields. The compost stays on the field for 3 years in natural cover which protects against erosion, and then it is recycled as organic soil into the mushroom growing process. After the organic soil is removed, the field is no-till seeded to hay with small grain and timothy or orchardgrass and kept in hay seeding for 2 years. In addition to providing composting material, the hay crop takes up excess nutrients from the soil and protects it from erosion. The compost curing fields have produced outstanding hay crops without the addition of any lime or fertilizer.

The mushroom farm in Armstrong County is finding more than one use for all materials involved in cultivating mushrooms. Runoff from the composting yard is collected and stored in the holding pond. From the pond, the water is recycled into an irrigation system and onto a field of reed canarygrass which is harvested for hay. Spent compost is used for mulch by landscapers. Some of the organic soil is reused in cultivating mushrooms, while the rest is either sold in bulk to the public or mixed with peat moss and sold as potting soil. The Pennsylvania State University Cooperative Extension Service has experimented with using the organic soil in no-till corn.

"One of the best trout streams in Pennsylvania borders the farm, and we want to keep it that way with the help of the Soil Conservation Service," said William Painter, vice president and general manager of Butler County Mushroom Farms, Inc.

Mr. Pysher is district conservationist, SCS, Kittanning, Pa.
Ms. Gingrich was a soil conservation technician, SCS, Kittanning, Pa. She is now a soil conservationist, SCS, Pittsburgh, Pa.

Butler County Mushroom Farms, Inc., employs more than 1,000 people. About two-thirds of the staff works underground. A miner's helmet and lamp are required gear.

—Photos courtesy Butler County Mushroom Farm, Inc.

Underground Greenhouse

Seedlings grown underground are being used in an extensive revegetation project and have a 90 percent rate of survival.

by Sharon L. Norris

The Bunker Hill Company is one of the world's largest underground lead-zinc-silver mines, located in the Coeur d'Alene mining district of northern Idaho. But something besides mining goes on 3,000 feet below ground at Bunker Hill.

In the sunless depths of an old, worked-out tunnel, thousands of pine tree seedlings are thriving in an underground greenhouse. The greenhouse is a narrow room, about 120 feet long. On wooden benches lining the sides of the room are racks and racks of seedlings. Light is supplied by several 1,000-watt halide lamps.

Almost all the necessary elements for plant life exist in the mine. The temperature is a constant 75° F, and the humidity is ideal for good growth. The exhaust ventilation tunnels contain enough carbon dioxide to support plant life, and there is no problem with insects or disease. A recently installed irrigation system replaces the old method of hauling in water by hand.

The underground greenhouse has many advantages over the conventional type. It doesn't require heating in the winter or air conditioning in the summer. Maintenance costs are minimal since there is no glass to replace or clean. And the trees grow about 70 percent faster in the warm, humid environment.

Ed Pommerening, Bunker Hill's revegetation engineer, designed the greenhouse. Currently, 48,000 trees are produced a year at a cost of about 6 cents each. The greenhouse can ultimately be expanded to a length of 510 feet and produce two successive crops of 100,000 container trees a year. In addition to trees, Pommerening plans to begin growing shrubs in the greenhouse.

It takes about a week for the locally gathered seeds to start sprouting in their individual plastic containers that resemble very long

Far left, Ed Pommerening, revegetation engineer for Bunker Hill Company (left), and Roger Gordon, supervisor, Kootenai-Shoshone Soil Conservation District, inspect a seedling in the novel greenhouse. Near left, seedlings are ready for transplanting in about 8 months.

ice cream cones. Then the seedlings grow about an inch per month. Trees started in September are transplanted in the spring. A second crop is started in March for transplanting in the fall.

A special tool is used at planting time that makes a hole in the ground exactly the shape of the container, allowing the seedlings to be transplanted with little disturbance to their root systems.

The underground greenhouse is part of a massive program underway to revegetate the denuded hillsides and river plain of Silver Creek Valley.

The vegetative history of the valley is one filled with problems caused by nature and man. Between 1910 and 1945, a series of forest fires destroyed much of the vegetation in the valley, and sulfur dioxide emmissions from the lead smelter and zinc plant damaged plant life and prevented natural regeneration of trees and shrubs.

Today, Bunker Hill Company successfully recaptures more than 70 percent of the sulfur dioxide emmissions, allowing revegetation to proceed.

Although natural reforestation has begun, the long-term revegetation program, now in its fourth year, will help. The program ultimately calls for more than 11 million trees to be planted on 18,000 acres in the Silver Creek Valley. It is jointly sponsored by the Bunker Hill Company, other area mining firms, the University of Idaho, and several Federal agencies.

The Kootenai-Shoshone Soil Conservation District was asked for advice and recommendations in the early planning stages of the revegetation program. As a result, Soil Conservation Service soil scientists conducted a special survey of the Coeur d'Alene mining district to obtain basic soils information. SCS also made an inventory of existing vegetation in the area and recommended plant species that might be adaptable.

According to Pommerening, 90 percent of the seedlings grown in Bunker Hill's greenhouse survive the shock of transplanting, even on the poorer planting sites. Bare root species which are conventionally used by tree nurseries have an 11 percent survival rate on the same sites.

Timber and mining executives are interested in the project, and not only because it is novel. It may prove to be the most efficient and economical way yet developed for producing the millions of trees required each year for reforestation and revegetation programs.

Ms. Norris is public information officer, SCS, Boise, Idaho.

Like troops in formation, racks and racks of seedlings line the walls of the underground tunnel, waiting to reclaim the denuded hillsides and river plain of Silver Creek Valley.

Conservation Blooms on White Flower Farm

by Gordon S. Smith

A Connecticut nurseryman maintains high production of top-quality plants with the help of conservation measures.

"We can't afford *not* to use conservation measures in our nursery if we want to stay in business," commented William B. Harris who owns White Flower Farm near Litchfield, Conn.

Harris operates his 90-acre farm with a firm belief in quality. It shows in the hardy plants he sells and in the fertile soil used to propagate his stock.

In the late 1930's, after a few early years as a rancher in Colorado followed by several years of New York City living, Harris and his wife bought an acre and a half of Connecticut land, including a 250-year-old barn.

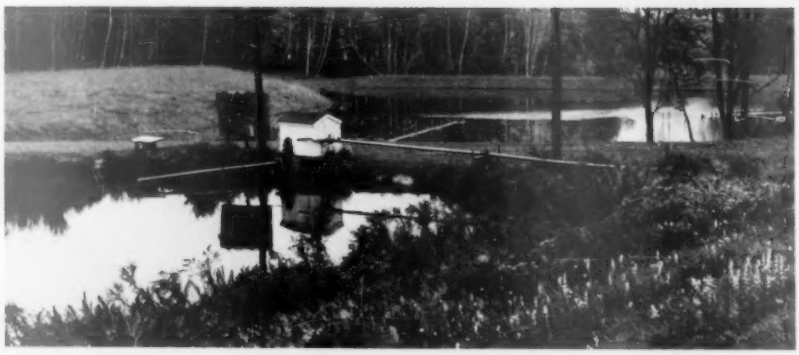
The Harrises' rural estate life soon aroused their interest in gardening and landscaping. At first, they concentrated on improving the gardens around their remodeled barn-home. But, when they purchased two adjoining properties soon after World War II, their interest in plant materials grew.

With their added acreage and a lot of basic knowledge of plants, the Harrises decided to give up their careers as writers and develop a top-quality nursery. At first, they considered a nursery that specialized in white flowers. The idea proved impractical, but it did lead to the name of their operation—White Flower Farm.

In researching the nursery idea, William Harris learned that many nurseries existed in this country, but few offered the new strains of perennials, such as 'Exbury' azalea, 'Symons-Jeune' phlox, or 'Blackmore' and 'Longdon' tuberous begonia. An American nursery spe-

The White Flower Farm employs 25 people year round. The number doubles during planting and harvesting.

Field Manager, Ian Waters (left), and SCS District Conservationist Arthur Cross check a diversion designed to handle excess runoff.



Harris has two large irrigation ponds that send water to most of his growing fields. SCS designed the pond in the background.

cializing in exceptionally good species of genera with quality plants true to variety might be quite successful, Harris reasoned. His research and ingenuity proved him right.

With a trip to England to see the famous Chelsea Flower Show, some visits to prominent English nurseries, and some later contacts with people at leading American nurseries, the Harrises began to develop their own nursery.

In the years that followed, the White Flower Farm grew into one of the quality nurseries of its kind in the country. Mail orders became the chief source of business. No wholesale orders were accepted and only a minimum of local buyers made purchases over the counter.

When asked why he became an avid conservationist, Harris replied, "In the early years of our nursery, excess water wasn't a real problem. That was during the dry years of the 1950's. All that changed in the early 1960's with a lot of excess water. We soon discovered that we needed some technical conservation planning help to find ways to handle the excess runoff water without eroding away our valuable soil."

In 1963, Harris became a cooperator with the Litchfield County Soil and Water Conservation District. This qualified him for technical conservation planning assistance from the Soil Conservation Service.

A firsthand look at the nursery gardens reveals numerous conservation measures used to protect the nursery land. A pattern of new trenches stretches across a field at the bottom of a gentle slope. Ian Waters, field manager at White Flower Farm, explains that the trenches are for a tile drainage system that is being installed in the 1½-acre field. The new tile system, designed by SCS technicians as part of the nursery's conservation plan, will have about 700 feet of tile laid a few feet under the surface to capture subsurface water and carry it out of the field.

"We've tried to grow crops on this field, but the seasonal high water table made it impossible," commented Waters. "Now, with the new tile system, we can use this field to grow nursery stock."

A diversion terrace designed by SCS was installed to carry excess rainwater from fields across a slope to a protected drainage area along the edge of nearby woods. More than 2,000 feet of these diversions have been constructed in the nursery fields, according to Waters.

Grass on the diversions is as neatly mowed as any lawn and for a good reason. Mowing keeps grass seeds from forming and invading the highly cultivated plant area near the diversions.

In the plant fields, a thick thatching of straw completely covers the soil. Waters explained that this is a mixture of sudangrass and horse manure plus a minimum of fertilizer. The mulch protects the exposed soil from erosion and enriches it.

Water from two ponds supplies an irrigation system that reaches just about all the growing fields in the nursery. Harris had built one of the ponds several years ago and built the second in 1975 as part of the irrigation system designed by SCS. A 5-horsepower pump, plus a newer 10-horsepower pump, can provide an almost endless supply of water to the gardens above.

"This water supply has been the difference between a poor and excellent crop in recent dry summers," said Waters. "Having water available exactly when you need it is a necessity when growing prime plants."

Looking to the future, Harris cleared a 10-acre field this year. This field will go through a strict series of soil improvement steps before being put into production in about 2 years. This, Harris indicated, will bring the nursery up to his planned peak expansion and production.

"In a service business like this, where top quality is our main selling point, we have to limit our size in order to maintain quality and efficiency," said Harris. "With a few more acres in production, and a few more conservation measures to help us keep our soil and moisture in place, we'll have an ideal conservation-oriented nursery."

Mr. Smith is head, information staff, Northeast Technical Service Center, SCS, Broomall, Pa.

News Briefs

—courtesy, Michael Jensen, Australian Information Service.

Conservation Down Under

People arriving by air at Alice Springs in central Australia are intrigued by large concentric circles on the ground that look like some kind of aboriginal art. The circles are part of a land conservation and dust control program being carried out by the Australian Arid Zone Research Institute. Furrows, pits, or banks are dug in circles to control runoff water and allow planting of perennial grasses to hold topsoil. Rows of trees are also used to reduce wind velocity. The work is helping in range management and in reducing dust problems around the airport and the town of Alice Springs.

National Irrigation Water Study Announced

A national study on use and management of irrigation water is being conducted by the U.S. Department of Agriculture (USDA), the U.S. Department of the Interior (USDI), and the Environmental Protection Agency.

"Irrigation is by far the biggest single use of water in the United States—averaging more than 100 billion gallons daily," Secretary of Agriculture Bob Bergland said. "Finding ways to make irrigation more efficient is essential to conserve water and improve water quality."

An Interagency Task Force on Irrigation Efficiencies, based in Washington, D.C., is scheduled to complete the study report by September 1978.

Secretary Bergland said the task force will identify water use and management problems in farm irrigation systems and in irrigation water delivery systems. It also will recommend Federal actions to better coordinate irrigation assistance to farmers from USDA's Soil Conservation Service and Science and Education Administration and USDI's Bureau of Reclamation.

The study follows two recent reports on irrigation by the General Accounting Office. The reports point out the need for detailed knowledge about potential for water conservation through irrigation improvements and about the economic, environmental, and social effects of such improvements.

An interdisciplinary Technical Work Group, with headquarters in Denver, Colo., was selected to gather and analyze field data.

The work group will solicit information and suggestions from a broad range of public interest groups and natural resource organizations, according to Secretary Bergland.

Land Treatment Effects on Water Pollution to Be Tested

The U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) announced locations in seven States where the effects of land practices on water pollution will be tested.

M. Rupert Cutler, assistant secretary of agriculture for conservation, research, and education, said most of the conservation work needed in the selected areas will begin this year and be completed within 3 years, providing a timely test of land management practices and demonstrating their value in improving water quality.

"The information gathered from these tests will be useful in cleaning up nonpoint source water pollution," he said. Runoff from feedlots and fields carrying sediment and chemicals into rivers and streams is an example of nonpoint source pollution.

The seven areas were selected from 50 applications in 42 States for their geographic situations and types of pollution problems. Existing USDA and EPA technical, financial, and educational assistance programs will be used to accomplish water quality goals in the areas. The project sites are in central Indiana, the Maple Creek watershed area in east-central Nebraska, the Delaware River (West Branch) area in south-central New York, the Little Washita River area in south-central Oklahoma, the Broadway Lake watershed area in western South Carolina, the Lake Herman watershed area in south-central South Dakota, and the South Yakima Conservation District area in south-central Washington.

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19–21	Izaak Walton League of America, Inc., French Lick, Ind.
23–27	National Federation of Business and Professional Women's Clubs, Inc., San Juan, Puerto Rico
30–Aug. 2	Soil Conservation Society of America, Denver, Colo.
August	
6–9	American Agricultural Economics Association, Blacksburg, Va.
13–16	Conservation Education Association, Logan, Utah
13–16	National Farm & Power Equipment Dealers Association, Calgary, Alberta, Canada
13–17	National Association of County Agricultural Agents, Boise, Idaho
14–18	First International Rangeland Congress, Denver, Colo.
21–25	American Fisheries Society, Kingston, R.I.
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10–14	International Association of Fish and Wildlife Agencies, Baltimore, Md.
12–16	Federal Bar Association Convention, Washington, D.C.
23–28	Environmental Sanitation and Maintenance Educational Conference, Exposition, Baltimore, Md.
25–28	Interstate Conference on Water Problems, Charleston, S.C.
27–Oct. 1	American Institute of Planners, New Orleans, La.

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Project CLEARWATER

August 19

Mark August 19 on your calendar. That's the day for Project Clearwater, when more than 500 volunteers will reshape a worn-out 245-acre farm in Frederick County, Md., into a model of soil and water conservation.

Project Clearwater is being sponsored by the Catoctin and Frederick Soil Conservation Districts to show that soil conservation also improves water quality.